

# The Performance of the Sinhala Cattle\*

BY

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IT would appear from a survey of the available literature on dairy cattle breeding in the tropics that numerous schemes have been formulated in recent years for the development of the livestock industry in different tropical and sub-tropical countries. Desirable or otherwise as such schemes may be, the fact remains that their intrinsic value is offset to some extent by the more or less complete absence of any established facts relating to the livestock of these regions. A correct scientific approach to the problem of livestock improvement under tropical conditions would indicate that the establishment of facts and the elucidation of the numerous problems peculiar to these regions should form the first step to the formulation of any rational policy of livestock improvement. The present paper attempts to furnish some of the information that is necessary in this connection regarding a breed of tropical cattle in Ceylon.

## SOURCE OF DATA

The material for this study was obtained from a herd of Sinhala cattle situated at Karagoda Uyangoda in the Southern Province of Ceylon. The farm lies approximately 6° N of the equator and has an average monthly temperature ranging from about 78° to 82° F. The average annual rainfall over the last fourteen years was 93 inches. Of this, 24 inches was received during the months of October and November and 12 inches in May, both of which together constitute two-fifths of the total rainfall. The rest of the rainfall was fairly evenly distributed through the rest of the year. January and February nevertheless often tended to be relatively dry months. The herd under consideration was started in 1937-38 on a total area of 107 acres. Local cattle of the black Sinhala type were purchased from different parts of the country and maintained on this farm in an attempt to determine the milch and draft potentialities of these animals. At the inception, only 2 stud bulls and 17 cows were purchased; but, during the years 1939-1942, 22 more animals were bought in, and the present herd, consisting of about 125 head of cattle, has been built up almost entirely from these 41 animals—very little outside blood being introduced into the herd during the fifteen years of its existence.

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## LIFE STATISTICS

The Sinhala cattle, which form the bulk of the cattle population of Ceylon, are characterized by their small size and stature and by the relatively poor development of hump and dewlap as compared with most other tropical and sub-tropical cattle. Their average birthweight on the basis of the present data was found to be 31 lb. for males and 29 lb. for females. It was also observed that calves from heifers generally averaged 2 lb. less at birth than calves from older cows. At maturity, the average weight of males was found to be about 600 lb. and that of females near 400 lb. The heifers have been generally put to the bull when they reached a liveweight of about 330 lb., and in consequence the average age at first calving has been 42.4 months. It seems reasonable to assume that if the rearing of calves was given greater attention, and the heifers brought to a good condition of flesh early in life, a late first calving could have been avoided. Experimental work in progress in this herd lends support to the view that it should be possible to induce early maturity in these animals by good feeding during the first six to eight months of life. The chief advantage of an early first calving is that it would decrease the average interval between generations and thereby tend to increase the rate of genetic improvement per year.

Regularity of calvings has been a noteworthy feature of the Karagoda-Uyangoda herd. The freedom from reproductive disturbances which this reflects seems to be characteristic of the Sinhala cattle. It appears likely that this regularity is due in large measure to the low milk yield of the cows—a point which we hope to verify, when more data accumulate, by a study of the genetic correlation between fertility and yield. Be it as it may, the average calving interval of 355 days is one of the lowest recorded for any herd of cattle.

The length of dry period, however, was exceptionally long and averaged 122 days. This means that the length of lactation was only 233 days. If the latter could be taken as a measure of persistency of yield, it would indicate that the persistency of the Sinhala cattle is very low. This was confirmed by a study of the shape of the lactation curves for first, second and later calvers separately. It has been suggested by some observers of the Sinhala cattle that one of the methods by which the length of lactation could be increased is "by selecting for breeding the cows with the longer lactation records". It is however not possible to subscribe to this view for the reason that the repeatability of lactation lengths in this herd is low and not significant ( $r = + 0.12$ ).

It was also found that the coefficient of variation of lactation length in this herd was 0.22. The number of lactations ending before 200 days was as high as 25 per cent which is very much in excess of the corresponding figure of under 5 per cent. for European conditions.

The average length of productive herd life at Karagoda-Uyangoda worked out at around 5 lactations. The average length of *total* productive life, however, may have been higher than this, as it is known that some of the animals sold from the herd continued their milking life in other herds.

There seems to have been no well-defined policy as regards breeding. Very little voluntary culling of heifers has been carried out, but a consistent attempt appears to have been made to breed bulls from the better cows. This is reflected in the almost negligible selection differentials obtained for dams of cows and the high selection differentials for dams of bulls. But the genetic advantages gained by the good selection of bulls have been offset to a very considerable extent by the late age at which bulls were used for service. The average age of bulls at first service was 56 months, while the lowest age was as high as 40 months. As the criterion of the efficiency of any breeding programme is the improvement per year rather than per generation, it is evident that for a sound breeding policy, bulls should be used for service at as early an age as possible so as to cut down the generation length.

Since its inception, the Karagoda-Uyangoda herd has been treated more or less as a closed one, and in consequence the intensity of inbreeding has risen for heifers and bull calves born in recent years to an average of 15 per cent. The effect of the inbreeding on the birthweight of calves was studied by computing the intra-sire regression of progeny birthweight on dam's inbreeding after correcting for differences due to sex of calves and differences due to lactation number of dam. The results, though not statistically significant, suggest that there is a tendency for decrease in birthweight as a result of increase in inbreeding. It was however not possible to determine the effect of inbreeding on milk yield in this herd, because most of the animals with high inbreeding coefficients have not come into production as yet.

### PRODUCTION STATISTICS

Perhaps one of the most characteristic production traits of the Sinhala cattle is the refusal of the dams to let down their milk if the calves are not allowed to suckle for some time at each milking. Repeated attempts with Sinhala heifers and cows to wean their calves at birth have hitherto not been successful. This is in striking contrast to the success we have had in weaning calves of other Asiatic breeds of cattle in Ceylon, and it is bound to be a great handicap if the Sinhala cattle are to be developed to any great extent as a pure breed for milk production.

The average milk yield per lactation in the Sinhala herd at Karagoda-Uyangoda as based on the total data was found to be 94 gallons, which was exclusive of the milk suckled by the calves during milking. It was found that the lower lactation yields in the herd were often associated not only with a low average daily yield but also with a short length of lactation—the correlation between total yield and average daily yield being  $0.82 \pm 0.02$  and that between total yield and lactation length being  $0.44 \pm 0.04$ .

The possibility of increasing the average level of production in a given population by breeding methods is largely dependent on the amount of variability obtaining within it. The higher the within-herd variability for

milk yield, the greater are the chances of improvement of this trait. In the Sinhala cattle, the coefficient of variation of milk yield was found to be of the order of 39 per cent. as compared with about 20 to 22 per cent. for cattle in temperate countries. This suggested that selection would be worth persevering with to some extent in the Sinhala cattle.

The effect of age at first calving on yield in the first lactation was analysed, and the regression value of 0·13 gallons that was obtained for an increase in age of one month was not significant. On the other hand the variation of yield with age in lactations was found to be considerable, though not so great as in European breeds. This variation is shown by the results obtained by the "paired-lactation" method, which eliminates most of the influence of selection. (See table).

<i>Yield in</i>	<i>1st Lact :</i>	<i>2nd Lact :</i>	<i>3rd Lact :</i>	<i>4th Lact :</i>	<i>5th Lact :</i>
..	79 galls.	.. 84 galls.	.. 84 galls.	.. 91 galls.	.. 80 galls.

The trend appears to be rather uneven, probably because of the small numbers involved. One fact that emerges fairly clearly is that peak production was generally attained by the fourth lactation which was reached when the cows were about six and a half years old. The rate of increase was such that by the time the cows had completed four lactations their yields had risen about 15 per cent.

A study of the distribution of calvings in this herd showed that the calvings were fairly evenly distributed throughout the year. Cows calving in June and November gave about 10 per cent. more milk than those calving in other months of the year. There is some suggestion that this may be related to the heavy rains of May and October.

The average repeatability of milk yield in this herd was studied by considering all cows that have had two or more lactation records. The first lactation appeared to have a lower repeatability than subsequent ones. This suggested that culling on first lactation should be carried out for heifers giving very little milk only. Culling on second lactation, however, should be much more rigorous, and in fact all culling for production performance should be completed by the end of the second lactation. The average repeatability, as obtained by weighting each of the independent estimates by the reciprocal of its squared standard error, was found to be 0·46. This figure is in close agreement with the results reported by various investigators for European cattle.

A reliable estimate of the heritability of milk yield within the herd could not be arrived at owing to an inadequacy of daughter-dam pairs. The estimates of repeatability nevertheless lend support to the view that heritability would probably be of the order 0·25—0·30. Such a figure would be of value in considering the probable genetic changes that could be brought about by selection.

We have actually used the figure 0·25 to estimate the probable rate of genetic improvement by selection in this herd over a period of thirteen years, and have obtained a value of 0·6 percent. of the average yield per year. Barely one-sixteenth of this came from the selection of dams of cows while the remainder was due to good selection of dams of bulls.

### DISCUSSION

It would appear from this study of the general life and production statistics of the Sinhala cattle that, among other things, the need for an early first calving and for a reasonably long lactation period had not been sufficiently appreciated during the period under review. Despite the fifteen years of existence of the farm at Karagoda Uyangoda, the age at first calving in 1951—which forms the last year under review—was even higher than the average age for the whole period 1937 to 1951 by about 6 months. The length of lactation in 1951 was also shorter by approximately three weeks. Experimental work now in progress at Karagoda-Uyangoda suggests, however, that with good feeding and management in early life it should be possible to rear heifers to maturity within a period of two years. Moreover, the results of our statistical analyses indicate that since the repeatability of lactation lengths is only 0·12, efficient management might bring about a positive response in lactation length as well.

Another interesting point that emerges from this study is that in spite of the relatively greater length of productive herd life and its effect on herd replacements among the Sinhala cattle, as compared with cattle in European countries the intensity of culling in this herd has been disappointingly low. If the high average age of cows and bulls at first service is added to this fact, one would have a fairly clear picture of the limitations that have hitherto been imposed on the breeding of Sinhala cattle at Karagoda-Uyangoda.

But it would be appreciated that even under optimum conditions of selection the rate of genetic gain in milk yield would hardly exceed 1 per cent. of the average yield per year. Obviously, this does not hold out much hope of rapid improvement in a herd with an average lactation yield of under a hundred gallons. Alternative breeding systems need to be tried out, such as crossing the local stock with a foreign breed of superior performance and interbreeding the progeny with a view to evolving a new type. From the standpoint of theoretical quantitative genetics there is no valid reason why such a method should not prove successful. In fact, it is interesting to note that it has met with practical success in the formation of a new breed of dairy cattle in Jamaica and also in the evolution of beef breeds elsewhere. It is hoped that the crossing experiments that we have now initiated at Karagoda-Uyangoda under closely controlled conditions would prove equally successful, and that the preliminary results would be available within about 4 to 5 years.